

a Rubber Scale . . .

F6F-3 Hellcat

By Mike Midkiff

The unsung hero of the Pacific theatre, Grumman's durable fighter amassed impressive service records in short order.

Designed specifically to combat the fast, nimble Japanese *Zero* after the outbreak of the war, the unsung *Hellcat* methodically and systematically eliminated almost all Japanese fighter opposition during the final two years of the war. Strangely enough, she never got the accolades literally heaped upon her more glamorous teammate, the F4U *Corsair*.

In a humble attempt to set the record straight, let's compare: Kill ratio: *Corsair* 12-1; *Hellcat* 19-1! Carrier landings: the *Corsair* required almost the entire war to solve carrier landing problems. The *Hellcat* could literally "stall and fall" in a controlled attitude until the deck came up to hit the gear. Speed: the *Corsair* was marginally faster at low altitudes, but at 10,000 feet they were even and at 30,000 angels, the *Hellcat* pulled away.

As further proof of the F6F's basic soundness and efficiency, there were only two variants produced through the war: the F6F-3

and the F6F-5. Both models totaled 12,274 aircraft produced by war's end, which amounted to over eleven aircraft per day! Truly this was an amazing production feat and a tribute to the basic simplicity and functionality in the *Hellcat*'s design. Perhaps the greatest tribute paid to the *Hellcat* was by Navy ace Gene Valencia of VF-9 who once remarked: "I love this airplane so much that if it could cook, I'd marry it."

The model represents an F6F-3, which was flown by VF-1 aboard the *Yorktown* sometime in 1944. At $\frac{3}{4}$ " : 1' scale, she is rather large as far as rubber power scale models go. Originally, my model had knock-off wings and adjustable ailerons, but I left them out of the design because little was gained to offset the added weight. I did however retain the plug-in landing gear, as this gives one the option of flying with or without the gear. Due to the size of the model, near scale airfoil thickness is a must for the wing, stab and rudder, or she just doesn't look right. Consequently,

some attention should be paid to careful wood selection to keep the weight no more than six ounces all up. I have used a semi-scale 3-bladed prop of about 11 inch diameter with satisfactory results, but a 2-bladed 12 inch diameter prop would be at least as satisfactory.

Construction notes

A model of this size and bulk requires extreme care in the selection of balsa wood to give adequate strength, yet at the same time minimum weight. With this in mind, the fuselage should be constructed as lightly as possible using hard balsa only for the $\frac{3}{32}$ basic box framework. All other areas—formers and sheet fill-in—must be made from light balsa. The wings should employ only medium to medium light balsa for leading and trailing edge stock and all ribs. Only the spar material should be medium to hard. All balsa blocks should be hollowed out and, in addition, be of the lightest balsa possible. Cut out



PHOTOGRAPHY: MOPSY MIDKIFF

Some heroes remain unsung. The stodgy but sturdy *Hellcat* chalked up a much more impressive record than her more glamorous colleague, the F4U *Corsair*.

lightening holes were possible in the larger formers and wing ribs. Jap tissue should be the only covering material considered since it has the lowest absorbency rate of any covering material. Do not use colored dope unless it is sprayed on with an airbrush. Weight is the single most important factor affecting the model's overall performance.

Fuselage construction

Typically, this style of fuselage is built with formers assembled to a vertical keel. Unfortunately, a large fuselage constructed in this manner borders on excessive weight. My solution is to use the basic box type structure and add light former sections to this box to provide the appropriate fuselage contour. This system not only saves weight, but also allows for better alignment control.

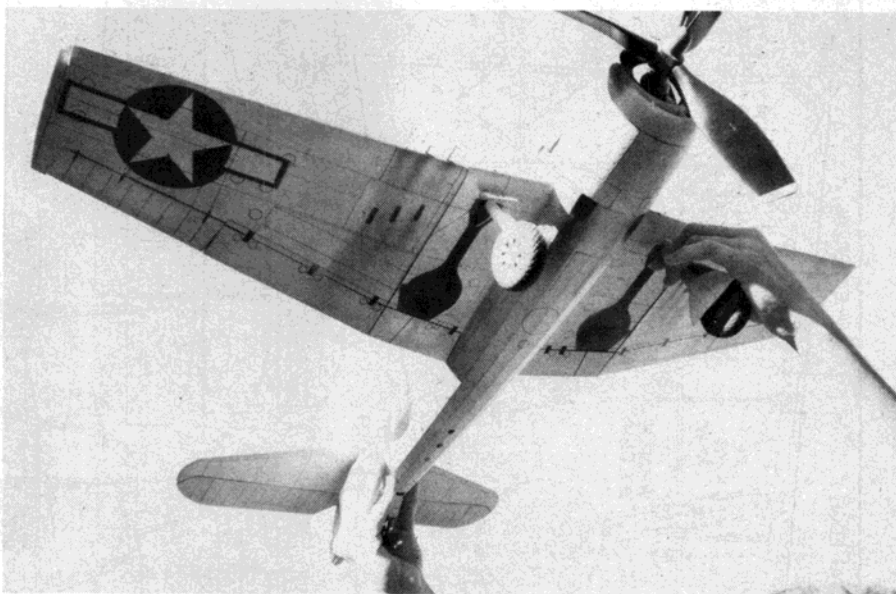
Start by building two identical fuselage side frames. Use hard, stringy $\frac{3}{32}$ square longerons with medium weight uprights. Note that the engine cowl area is built separately from the fuselage and added later. After the fuselage frames are dry, remove, separate and add the required $\frac{3}{32}$ square cross pieces except at station "K" where the former is glued in place. Cut out all of the top, bottom and side former sections from light $\frac{1}{16}$ sheet. Do not notch out yet for the $\frac{1}{16} \times \frac{1}{8}$ stringers, but mark where each one goes. Cut out the notches for the two stringers on the horizontal center line; glue and assemble these two in place, making sure that the side formers are true before the glue sets up. Cut out the $\frac{3}{32}$ sheet wing mounting plates and glue in place where the side formers are notched out. Take care that these are lined up properly; these define the wing location. Glue in place the wing compression brace at station "G". Check alignment and notch out for all of the other $\frac{1}{16} \times \frac{1}{8}$ stringers, and glue in place. Add light $\frac{1}{16}$ sheeting between the stringers at stations C-D and D-E. Add the light $\frac{1}{8}$ sheeting between the formers along the top of the rear fuselage, and the light $\frac{1}{16}$ sheeting above and below the stab opening.

Build the engine cowl portion of the fuselage by cutting out two formers from medium light $\frac{3}{32}$ sheet and notching out for four $\frac{1}{8} \times \frac{1}{4}$ short stringers. Glue these four stringers in place and wrap and glue light $\frac{3}{32}$ sheet around the framework. Glue on the front of this cylinder another $\frac{3}{32}$ former, orient this one so the grain is at 90 degrees. Carve out the $\frac{1}{2}$ inch thick front engine cowl block; the inside contour is finished before it is glued in place.

Cut out the removable nose plug opening and finish shaping the engine cowl assembly using the side and top views on the plan for reference. Don't glue this to the front of the fuselage yet. Finish out the fuselage framework by gluing the rear motor mount in place. Don't forget the $\frac{1}{32}$ ply doubler here. Make, hollow out, and glue in place the block at the rear of the fuselage. Add some sheet fill-in in the area of the tail wheel and glue in place the two $\frac{1}{32}$ I.D. mounting tubes. Finally, scallop between stringers and cut out lightening holes to reduce weight as much as possible.

Wing construction

The wings are constructed in the time-honored manner by pinning down the leading and trailing edges and the bottom spars. Glue and assemble all of the ribs in place (note the break in #1 rib) except the outside #3. This is assembled later after the wing is separated at the dihedral joint. Remove the



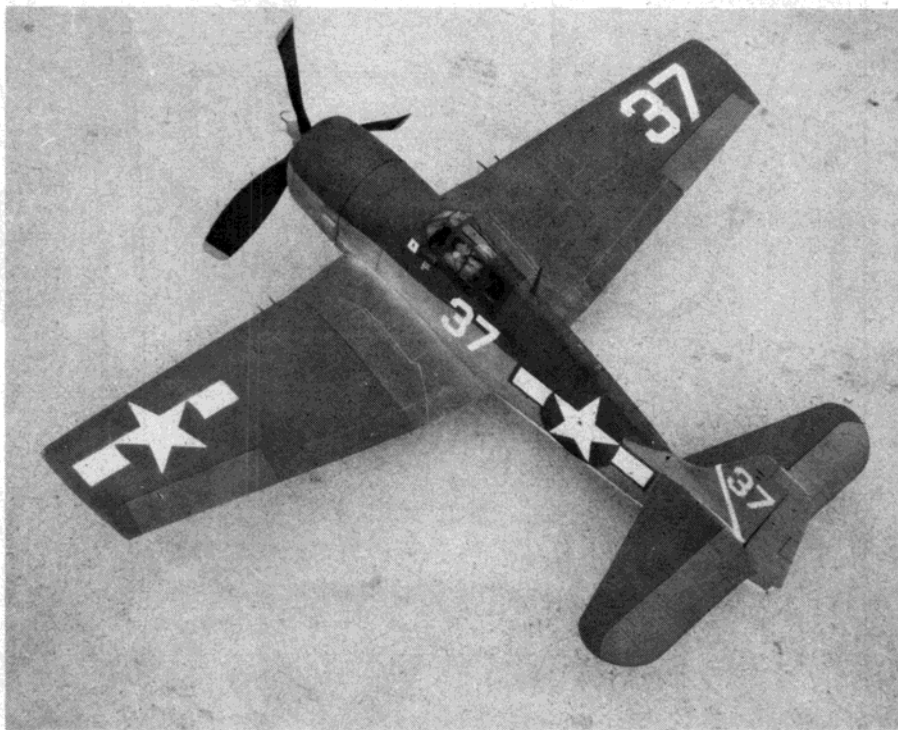
The landing gear plugs in on the Hellcat so that a little weight and some extra drag are reduced when flying. Watch your wood selection since the maximum weight should be no more than six ounces.

wing from the building surface and carefully cut the leading edge, trailing edge, and the two bottom spars at the dihedral line just outside the assembled #3 rib. Re-pin the outer wing panel back on the building surface and add the remaining #3 rib with the proper dihedral slant in this rib. After this is dry, remove and add all of the top spars and the $\frac{1}{64}$ ply webbing between ribs #1, #2, and #3. Now glue in place the ply-balsa-ply landing gear and the tube mounting assembly. Look carefully at the cross section on the drawing to clarify how this is done. Drill and glue in place the brass tubing which provides the sockets for the main gear. Carefully locate and glue the $\frac{3}{32}$ diameter hardwood dowel in

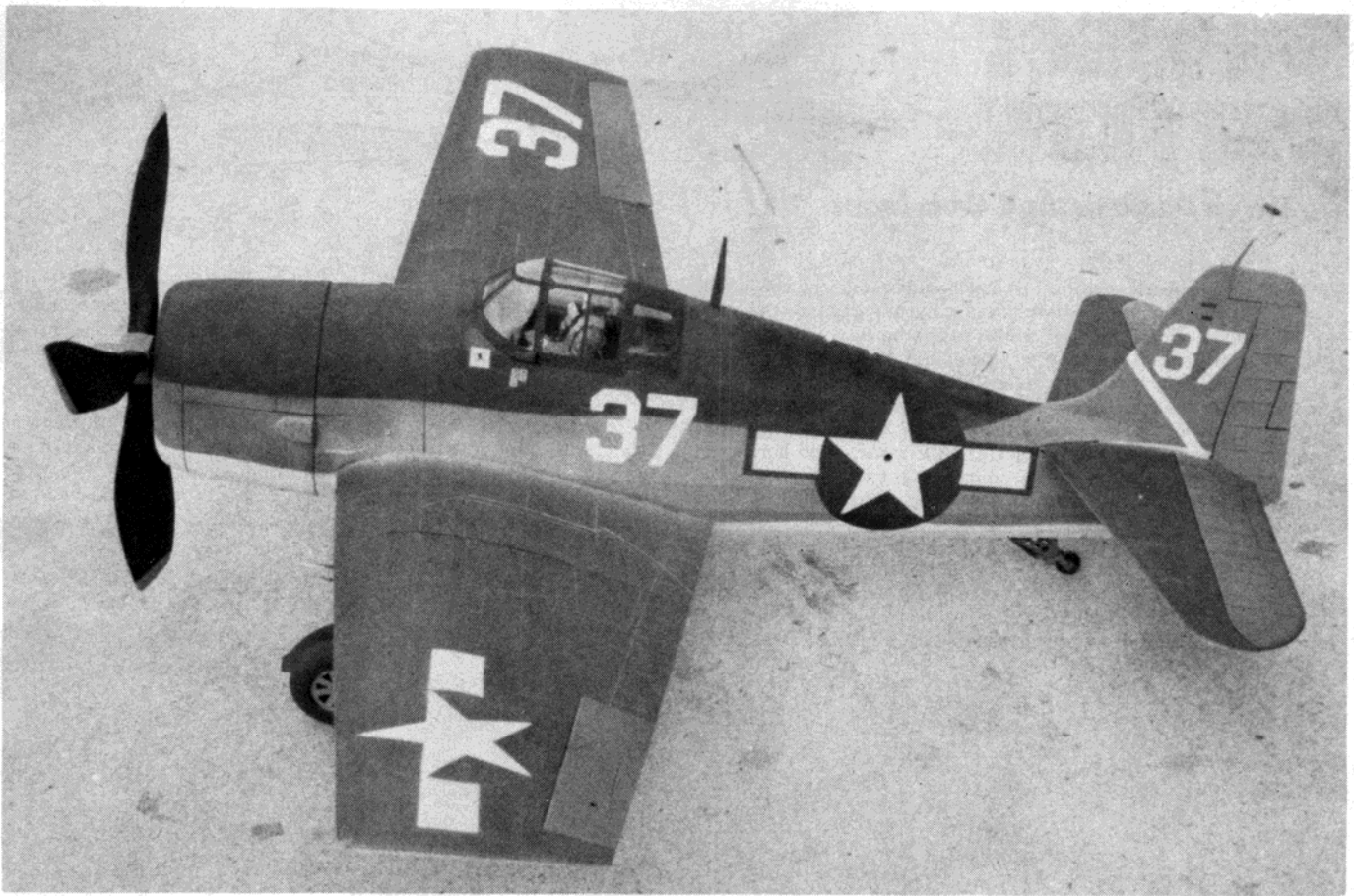
place. This dowel gives some compression strength to resist landing impact shock. Hollow out and assemble the wing tip block to the end rib. Glue in place all of the gussets shown; these are made from $\frac{3}{32}$ sheet balsa. Carefully shape and sand the leading and trailing edges to blend into the airfoil shape. Pay particular attention to the matchup of the two #3 ribs at the inner and outer panels. When satisfied, glue these two panels together and notch out for the two dihedral braces. Glue these braces securely in place.

Stab and rudder construction

The construction of the empennage is a little different and more involved than the con-



Mike's Hellcat represents an F6F-3, and is painted in the three color scheme employed on practically all of that model. He covered it with white Jap tissue and airbrushed the colors, numbers, and insigniae.



If you have nerves of steel (or won't fly the model) you can apply a good bit of finish detail to really make the model "come alive".

ventional flat structures seen on smaller models. A model this size just wouldn't look right without scale thickness tail feathers. Start by cutting out the tapered spars for the stab, fin, and rudder. The rudder is built separately from the fin to facilitate offsetting, if necessary, for proper flight trim. Pin the spars to the building board with the appropriate thickness shims to support the small end of each spar. Cut out, glue, and assemble all of the leading and trailing edge parts using the same thickness shims as used under the spars. Cut out, fit, and glue in place the laminated tips and the various other $\frac{1}{8}$ sheet parts. Don't forget the shims for these also. Lastly, cut out, and glue in place all of the sheet ribs and gussets. After these surfaces are dry, remove, and sand carefully to a symmetrical airfoil shape.

Covering, assembly and finishing

All of the individual structures are doped and covered before assembly, except the fin, which is assembled and glued in place on the fuselage before covering so that the covering blends from the rear fuselage turtle deck into the fin. I use the method of doping the framework three times, sanding lightly between coats and applying the tissue by brushing thinner through the tissue. This allows wet tissue to be applied to negotiate some of the compound curves resulting in fewer pieces of tissue used to cover the fuselage.

If you are doing an F6F-5, the color scheme can be accomplished with dark blue tissue only. However, the F6F-3 is a little more complicated in that almost all were done in the three-color scheme characteristic of that time

period. I suppose one could duplicate this using white, light blue, and dark blue tissue, but it would be quite a chore. I chose to cover entirely in white Jap tissue and airbrush the various colors, numbers, and insigniae in place.

After all the covering, doping, and color application is complete, assemble and glue the stab in its appropriate slot, and don't forget to add the small section of fuselage to fill the open slot behind the stab. Glue the rudder in place with a small amount of left turn. Plug in and glue the wings to the fuselage. Be extremely careful here to have equal incidence and dihedral. Now reach through the front of the fuselage and glue securely the wing/fuselage brace to the spar stubs and the adjacent former. If the engine cowl had been glued to the fuselage, you could not have reached in to assemble the brace. Finally, glue the engine cowl to the front of the fuse.

Finish detailing the cockpit area to your satisfaction and attach the canopy. Make and assemble the various lights, antenna, pitot tube, gun barrels, and other external details which give the model that personality.

I use a black "Sharpie" marker to scribe panel lines on the white and light blue areas and grey Floquil paint in a ruling pen applied to the dark blue areas.

If you have the guts, apply the exhaust streaks, weathering highlights, and gun powder streaking where appropriate and watch your model really come alive.

After applying all the finish detailing that the nerves will allow, I spray the entire model with a light coat of clear to "lock" everything together and reduce smudging.

Flying

Locate the C. G. as shown on the print and install a rubber motor of six to eight strands of $\frac{3}{16}$ or equivalent size. Both wing tips should have about a quarter inch of wash-out with a little more on the right wing. Also, the decalage should be approximately two degrees between the wing and the stab. Start trimming flights with moderate right and down thrust. By using thrust adjustments only, try to achieve a shallow wide left hand climbing turn. Don't be concerned about the glide trim yet; concentrate only on a good steady climb-out and cruise by utilizing thrust adjustments only. After you have a consistent, steady climb-out using near full power, work on the glide trim. A glide circle to either the right or left is okay as long as neither tighten up to become a spiral dive. Achieve glide turn with the rudder by movements of no more than one sixteenth of an inch at a time. As you move the rudder, offset the side thrust of the nose block in the opposite direction the same amount: if you put in $\frac{1}{32}$ left rudder, add $\frac{1}{32}$ right thrust and vice-versa. After all appears okay, install a fresh, lubed motor and go to near max winds, observe the total flight, and make minute corrections to the thrust setting or rudder to groove the total flight pattern. Under full power without the landing gear, your Hellcat should easily top a minute without thermal assist if properly trimmed.

Your Hellcat, replete in its dark color trim, circling about fifty feet away in that characteristic, pugnacious "tail low" Hellcat attitude makes you feel sorry for that Zero that just missed on her first pass.